



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

December 5, 2013

Group Chairman's Factual Report

AIR TRAFFIC CONTROL

DCA13MA120

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A. ACCIDENT

Location: San Francisco International Airport (KSFO), San Francisco, California
Date: July 6, 2013
Time: 1128 Pacific daylight time¹ / 1828 coordinated universal time²
Airplane: Asiana Airlines flight 214 (AAR214), Boeing 777-200ER

B. AIR TRAFFIC CONTROL GROUP

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C. SUMMARY

On July 6, 2013 at 11:28 pacific daylight time, a Boeing 777, registration HL7742, operated by Asiana Airlines as flight 214, struck the seawall short of runway 28L at San Francisco International Airport. The airplane was destroyed by impact forces and fire. Three of the 291 passengers were fatally injured. The flight was a regularly scheduled passenger flight from Incheon International Airport, Seoul, Korea, and was operated under the provisions of 14 Code of Federal Regulations Part 129. Visual meteorological conditions prevailed at the time of the accident.

D. DETAILS OF THE INVESTIGATION

The air traffic control group convened on Sunday, July 7, 2013, at the National Transportation Safety Board (NTSB) incident command center (ICC). The workgroup received an update from the investigator in charge (IIC) of the accident, and coordinated with the FAA event investigation manager to obtain FAA air traffic control (ATC) data.

On Monday, July 8, 2013, the group met with Mr. Andy Richards, San Francisco air traffic control tower (SFO ATCT) air traffic manager (ATM) for an in-brief. Others present were Mr. David Foyle, Sierra-Pacific district manager, Ms. Carole Lozito, SFO support manager, Ms. Lisa Stephenson, SFO NATCA facility representative, Mr. Mark Sherry, SFO operations manager,

¹ All times are expressed in pacific daylight time (PDT) unless otherwise noted.

² UTC – Coordinated Universal Time – an international time standard using four digits of a 24-hour clock in hours and minutes based on the time in Greenwich, England.

Mr. Faron Hahn, FAA technical operations, Mr. Shedrick Willis, FAA technical operations, Bradford Drake, FAA technical operations, Andy Dilk, FAA general counsel's office, Mr. Todd Luepker, FAA event response group, and Mr. Mike Meigs, western service area (WSA) quality assurance. The group conducted a tour of the control tower and reviewed all associated data related to accident.

On Tuesday, July 9, 2013, the group reconvened at the NTSB ICC and continued collecting ATC data from FAA sources.

On Wednesday July 10, 2013, the group reconvened at the NTSB ICC and continued requesting FAA data. The group completed field notes and concluded onsite investigative activities.

On October 24, 2013, the group reconvened at the FAA's Atlantic City Technical Center to conduct an examination of the minimum safe altitude warning system.

E. FACTUAL INFORMATION

1.0 History of Flight

AAR214 was a Boeing 777-200ER operating as a scheduled 14 Code of Federal Regulations Part 129 passenger flight from Incheon International Airport, Seoul, Korea. After arriving in the SFO terminal area, the flight was vectored for a visual approach to runway 28L by Northern California Terminal Radar Approach Control (NCT). The flight was cleared for the visual approach by NCT at 1121:57. The pilots attempted contact with SFO ATCT controllers at 1125:56, transmitting "Good morning Asiana two one four, final 7 miles out two eight left." There was no reply from SFO ATCT.

At 1126:59, Asiana 214 re-attempted communications with SFO ATCT, transmitting "Asiana two one four short final."

At 1127:08, the SFO ATCT local controller responded to the pilot of AAR214, transmitting "Asiana two one four heavy San Francisco tower runway two eight left cleared to land." At 1127:10, the pilot acknowledged the clearance to land.

At 1128:08, SFO ATCT instructed SkyWest flight 6389 to go around.

At 1128:26, the pilot of AAR214 contacted SFO ATCT who responded "Asiana two fourteen heavy emergency vehicles are responding."

At 1128:33, AAR214 made a second attempt to contact SFO ATCT, who responded, "emergency vehicles are responding."

At 1128:38, AAR214 transmitted "uh, uh, (unintelligible) uh, Asiana (unintelligible)."

At 1129:06, SFO ATCT transmitted to all aircraft on frequency that SFO airport was closed.

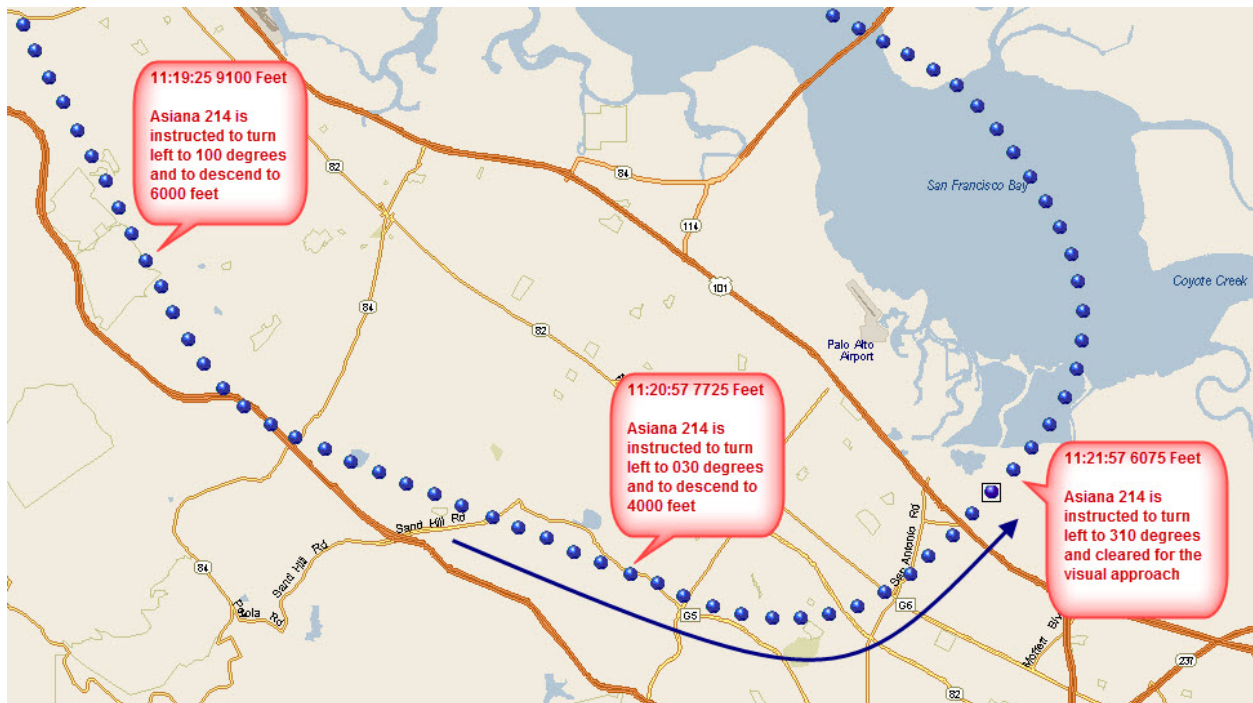


Figure 2 - ADS-B plots of the downwind to base leg turns and times of transmissions.



Figure 3 - ADS-B plots showing the full final approach segment.



Figure 4 - ADS-B plots of the final approach segment.

3.0 Weather Information

The SFO weather for July 6, 2013, was obtained from the KSFO Automatic Surface Observing System (ASOS).⁴ At 1056 PDT, the SFO ASOS weather was reported as wind from 210 degrees at 6 knots, visibility 10 statute miles, few clouds at 1600 feet⁵, temperature 18° Celsius (C), dew point 10° C, altimeter setting of 29.82 inches of mercury.

METAR KSFO 061756Z 21006KT 10SM FEW016 18/10 A2982

The SFO Automatic Terminal Information Service (ATIS) broadcast at 1056 PDT was:

“San Francisco International Airport Information Kilo, 1756 Zulu, wind two one zero at 6, visibility one-zero, few clouds at one thousand six hundred, temperature one eight, dew point one zero, altimeter two niner eight two, remarks, a oh two sea level pressure zero niner seven, one zero one eight three two zero, one two eight five, one zero zero five. Simultaneous charted visual flight procedures in use. Landing runway two eight left, two eight right. Depart runway one left, one right. Notices to airmen, two eight right, two eight left glideslope out of service, runway two eight right, two eight left approach light system out of service. Read back of all runway holding instructions is required. All aircraft are required to include aircraft call sign in the read backs and acknowledgments of ATC instructions and clearances. Advise on initial contact you have information kilo.”

⁴ ASOS – The Automated Surface Observing System is equipped with meteorological instruments to observe and report wind, visibility, ceiling, temperature, dew point, altimeter, and barometric pressure.

⁵ All altitudes for weather observations are reported as above ground level (AGL)

For additional weather information see the Weather Group Chairman's report available in the docket.

4.0 San Francisco International Airport Runways

San Francisco International Airport was served by four runways; runways 1 L/R and runways 28 L/R (see figure 3). Runway 1L is 8646 feet long and 200 feet wide, and runway 1R is 7500 feet long and 200 feet wide. Runway 28L is 11,381 feet long and 200 feet wide, and runway 28R is 11,870 feet long and 200 feet wide. The runways intersect at approximately the center of the airport. On July 6, 2013, SFO was arriving runways 28L/R, and departing runways 1L/R.

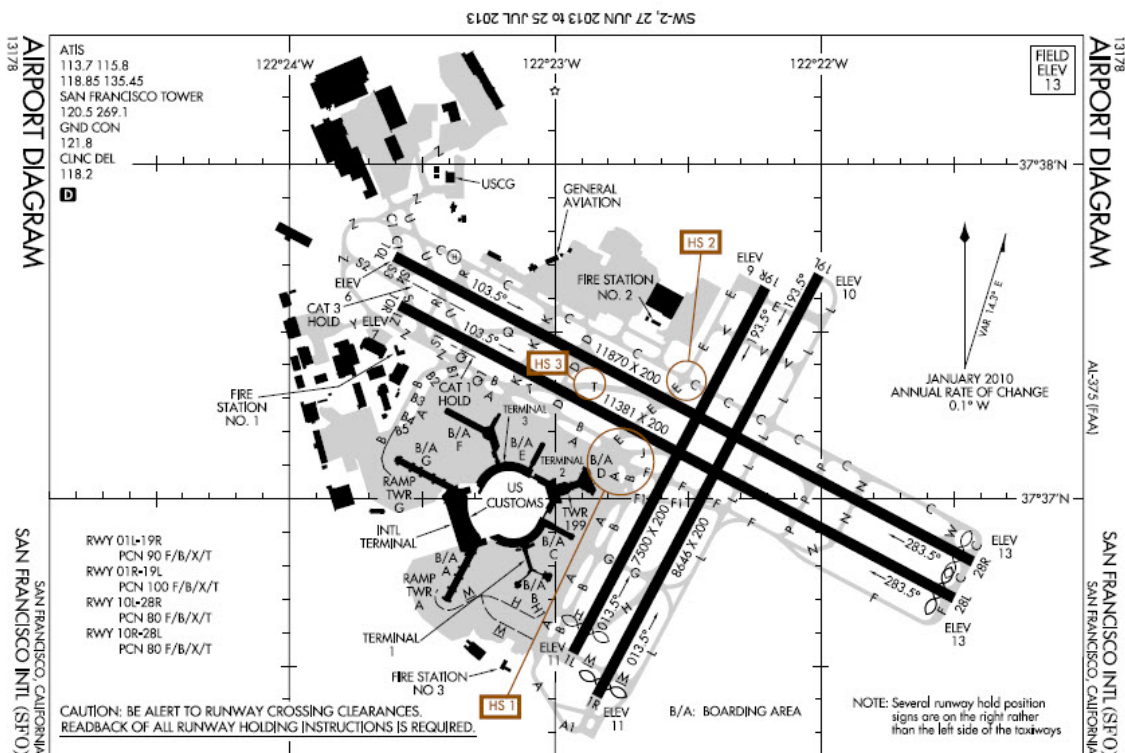


Figure 5 - Airport diagram of SFO illustrating the runway layout and intersections.

Beginning in July 2012, SFO runways had undergone a construction project to make them compliant with a congressionally mandated requirement to increase the runway safety areas (RSA). The construction project increased the RSAs to a full 1000 feet by extending the length of the runways to the west, and moving the runway 28L threshold west to achieve the required RSA. This created an RSA that began at the sea wall and extended 1000 feet to the runway 28L threshold. Also, as part of the construction program, the glideslope for the runway 28L instrument landing system (ILS) was taken out of service on June 1, 2013, in order to move the glideslope antenna. The new glideslope antenna was scheduled to be commissioned on August 22, 2013.

A flight check conducted on July 2, 2013, certified the precision approach path indicator (PAPI) lights serving runway 28L with a 2.85 degree glideslope. FAA technical operations (Tech Ops) provided the flight inspection report for that evaluation. Runway 28L/28R closely spaced parallel operations are outlined in a local SFO ATCT order. The order detailed the ongoing study of 2.85

[illegible]

5.0 Air Traffic Control (ATC)

AAR214 first contacted NCT at 1111:05 when the airplane was descending through 11,325 feet to 11,000 feet. NCT instructed the pilot to depart the SFO very high frequency omnirange (VOR) heading 140 degrees and advised him to expect a visual approach to runway 28L. The NCT air traffic controller did not verify the pilot had received the appropriate ATIS broadcast.

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with a speed restriction of 210 knots. The controller acknowledged and provided a wake turbulence advisory that AAR214 was following a Boeing 777. At 1119:25, the pilot was instructed to descend to 6000 feet and fly heading 100 degrees. At 1120:57, the pilot was instructed to descend to 4000 feet and fly heading 030 degrees.

At 1121:57, the pilot reported the airport in sight. AAR214 was about 16 miles from the end of the runway. The controller instructed the pilot to turn left to 310 degrees and cleared him for the visual approach to runway 28L. AAR214 intercepted the final approach course about 14 miles from the end of runway 28L at 4,500 feet.

All Nippon Airways flight 8 (ANA 8), a B777, was immediately preceding AAR214 on the visual approach, and intercepted the final approach course about 11 miles from the end of runway 28L. At that point, ANA8 was descending through 4,100 feet. When AAR214 passed the same point on final approach, it was also descending through 4,100 feet.

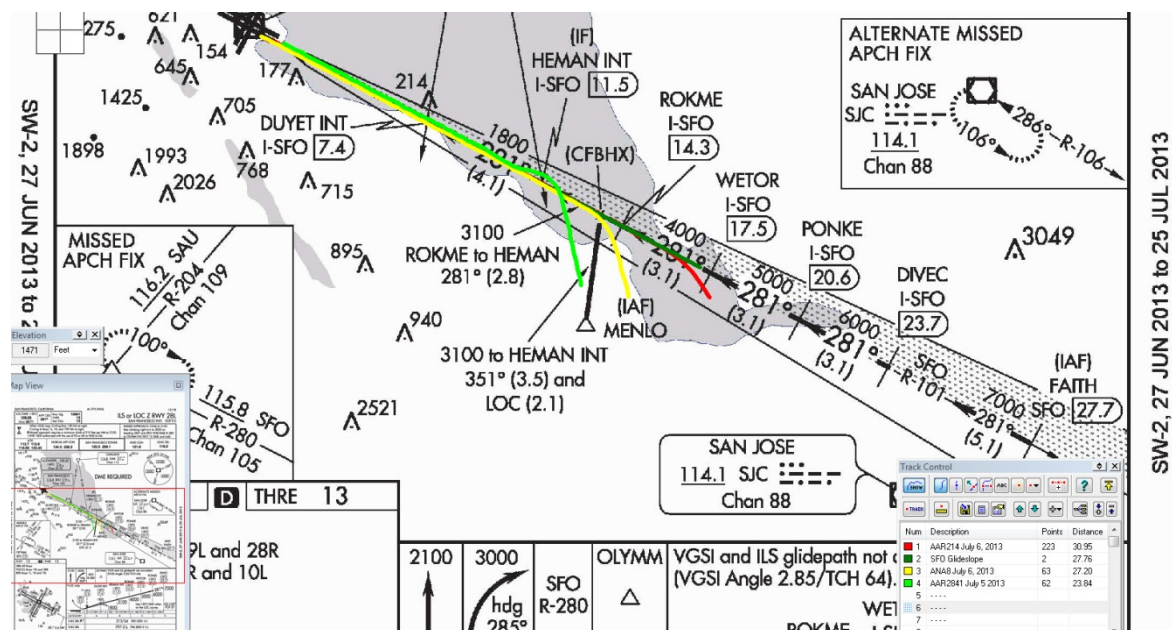


Figure 7 – The plotted radar tracks of the accident airplane, ANA8, and AAR2841.

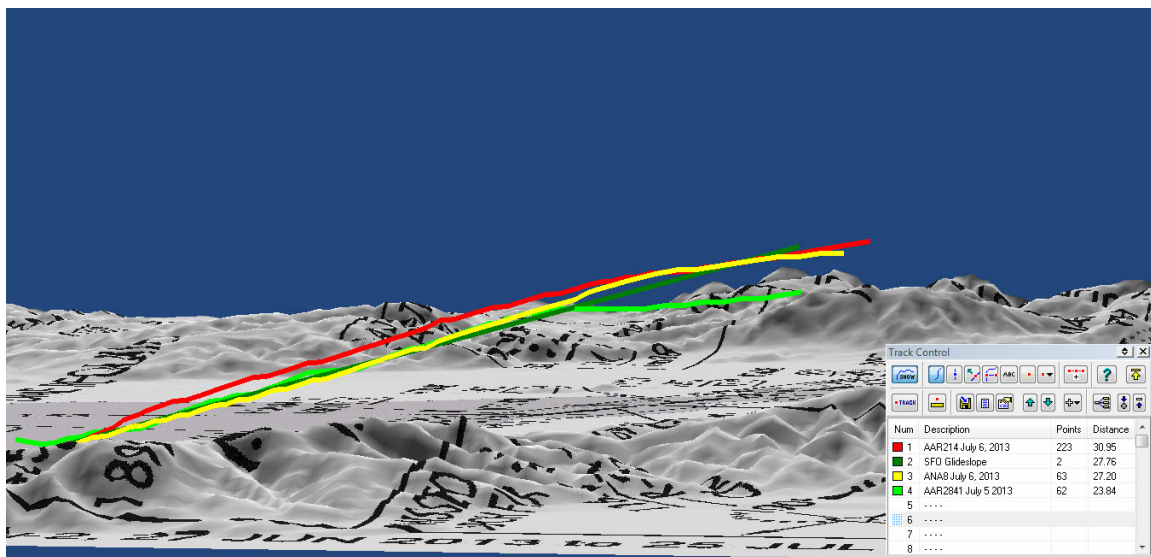


Figure 8 – A profile view of the plotted radar tracks of the accident airplane, ANA8, and AAR2841.

At 1123:17, NCT instructed the pilot to fly 180 knots until a five mile final to runway 28L, and at 1125:36, the pilot was instructed to contact SFO. The speed restriction of 180 knots until a five mile final had also been issued to ANA 8 immediately before AAR214.

The pilot of AAR214 contacted SFO ATCT at 1125:56, when the airplane was about 4.67 miles from the end of runway 28L. SFO LC did not immediately respond to AAR214 because they were issuing control instructions to other departures and arrivals. At 1126:59, when the airplane was about 1.9 miles from the end of runway 28L, AAR214 re-attempted communication with SFO ATCT. The controller acknowledged AAR214's transmission and a landing clearance was issued when the airplane was about 1.5 miles from the end of the runway. The landing clearance did not include the runway surface wind. At 1127:55, while the LC was radar identifying a helicopter requesting a class B transition, an air traffic controller can be heard in the background of the ATC voice communications asking, "...what happened over there?"

After AAR214 crashed onto the runway, the LC OJT instructor began instructing landing traffic to runways 28L and 28R to execute a go-around, and began to transfer arriving traffic back to NCT. The SFO crash phone was activated and airport rescue and firefighting (ARFF) personnel responded.

The LC instructor and trainee were both "shaken up" because of the accident and requested FAA-approved trauma leave. All air traffic controllers working in the tower cab during the accident provided witness statements describing what they observed when the crash occurred.

6.0 Minimum Safe Altitude Warning (MSAW)

NCT and SFO ATCT utilized an MSAW system to alert controllers when an airplane was below, or was predicted by the radar system computer to go below, a predetermined minimum safe altitude. The SFO MSAW adaptation consisted of two areas, a "Type 1" area and a "Type 2" area. The Type 1 area began at the approach end of the runway (AER) and extended out the approach path to a point 2 miles from the AER. MSAW alerts occurring within Type 1 areas are suppressed. The Type 2 area extended from the end of the Type 1 area to a point 5 miles from

the AER. MSAW functions are enabled within Type 2 areas. The SFO Type 2 area contained a current warning slope and a predicted warning slope. The current warning slope started at the beginning of the Type 2 area and extended out the approach path at an angle of 0.68 degrees. The predicted warning slope started at the beginning of the Type 2 area, 100 feet below the current warning slope, with an angle coincident with the current warning slope. According to radar data obtained from the FAA, there were no MSAW alerts generated by the radar system while AAR214 was operating in the SFO Type 2 area.

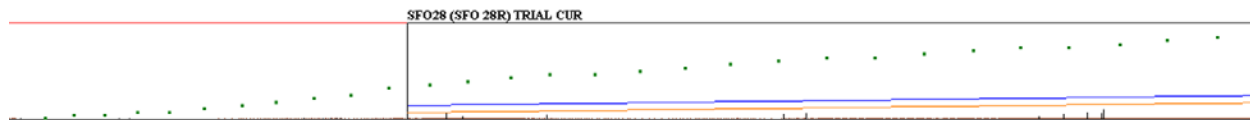


Figure 9 - SFO MSAW Type 2 area current warning slope (blue line) with radar targets.

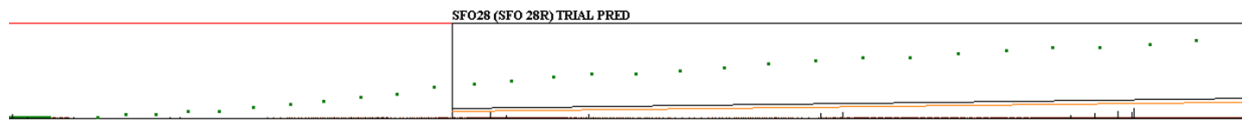


Figure 10 - SFO MSAW Type 2 area predicted warning slope (black line) with radar targets.

MSAW alerts are generated under two conditions: when an aircraft is radar-observed operating below the current warning slope, or when an aircraft is predicted to be operating below the predicted warning slope within the next 22 seconds.

On October 24, 2013, the FAA ran a test of the NCT Common ARTS system to determine if the Type 1 or Type 2 MSAW adaptation affected MSAW alerting to air traffic controllers. The MSAW adaptation was reconfigured with the Type 2 area adjusted to 1 mile from the AER. The MSAW system did not alert.

Submitted by:

Charles Olvis
Air Traffic Control Investigator
December 5, 2013